

## ORNITHOLOGICAL LITERATURE

AVIAN BIOLOGY, VOL. 4. By Donald S. Farner and James R. King (eds.). Academic Press, New York and London, 1974: xxii + 504 pp., many charts, graphs, drawings, and black and white photographs. \$37.00.—Chapter 1, by Terence Bennett, deals with the peripheral and autonomic nervous systems. There is a brief review of the 12 cranial nerves (*n. terminalis* is absent in birds) giving their nuclei in the brain and their disposition, and a brief discussion of spinal nerves. Somatic afferent innervation is discussed with particular attention to muscle spindles, tendon organs, sensory capsules, and cutaneous receptors. Visceral afferent innervation is considered in terms of respiratory, cardiovascular, and gastrointestinal systems. The somatic efferent, somatic afferent, and visceral afferent innervation are considered together under the heading "peripheral nervous system", although the p.n.s. was earlier defined from a purely structural standpoint as comprising essentially the cranial and spinal nerves. There is thus some confusion between a strictly structural division of the nervous system (central and peripheral sections) and a functional division (somatic afferent, somatic efferent, visceral afferent, and visceral efferent), but this is apparently followed for convenience in writing, as the largest part of the chapter is devoted to the visceral efferent (autonomic) system. This is perhaps one reason why Bennett follows Campbell's definition of the autonomic system as those efferent pathways with peripheral ganglionic synapses. Caution is advised against assuming simple correlations between types of transmitter substances and sympathetic or parasympathetic systems. The distinctions between these systems are not always clear in birds, and the terms are avoided in this chapter. The bulk of this section is devoted to detailed descriptions of the autonomic ganglia, followed by reviews of the innervation to the cardiovascular, respiratory, digestive, excretory, genital, endocrine, and integumentary systems, and the eye. Under each system the component organs are discussed individually.

This chapter is largely an extensive literature review, and points up many areas where precise information is lacking. It also shows that most information on the avian nervous system is still based on the domestic chicken. Bennett has written an exhaustive literature review, giving more than 30 pages of references, but only one illustration. A remarkable amount of information is summarized here, but there is little attempt at a general synthesis.

In Chapter 2 M. Menaker and A. Oksche discuss the avian pineal organ. Several distinct structural types are recognized in different birds, but most of the work has been limited to a few species. Detailed accounts are given of pineal cell types, nervous apparatus, secretory apparatus, and vasculature. With respect to function, much experimental evidence is reviewed and found to be contradictory. This is attributed to a lack of experimental controls resulting from a failure to appreciate the complexity of the problem. The pineal appears to be involved in integrating photoreception, circadian rhythmicity, and long-term control of the reproductive cycle. Much of the problem may arise from the fact that a good deal of the experimental work has been done on the chicken, in which artificial selection has modified or eliminated the normal environmental control of reproduction. An understanding of the general function of the avian pineal has not yet been achieved.

In Chapter 3 Walter J. Bock discusses the avian skeletomuscular system. The 2 systems are considered together because of their close functional relationship. In

A. J. Marshall's *Biology and Comparative Physiology of Birds*, to which *Avian Biology* is a successor, separate chapters were devoted to these systems; Bock feels that a similar review is undesirable now because little new material has appeared since that work was published. Instead he devotes this chapter to "an inquiry into the foundations, methodology, and goals of evolutionary morphology as exemplified by the avian skeletomuscular system." He points out that despite the great volume of literature on descriptive morphology, much is not applicable to current problems because of inadequate detail. He urges that current workers not merely describe structure for its own sake, but base all descriptive studies on specific questions in avian biology. Nomenclatural problems are discussed, and Bock refers to the hoped-for establishment of a standardized nomenclature of avian anatomy by the International Committee on Avian Anatomical Nomenclature.

The functional morphology of the skeletomuscular system is considered at great length. Bock feels that most work to this time is inadequate because of poor understanding of the complexities of the system, especially the muscles. The biomechanics of the skeleton are analyzed with examples from Bock's own work, particularly on the skull. The physiology of muscle is treated in detail, and the point is made that so many aspects of muscle function are not apparent from gross examination, that simple description and measurement (e.g. of muscle mass as a measure of strength) do not permit a valid examination of the functional capabilities of the system. Bock discusses the kind of approach necessary to give a meaningful functional analysis of the skeletomuscular system. This includes the use of the engineering technique of free-body diagrams and the analysis of torques as well as linear forces. This method of analyzing the function of the skeleton should be studied by all workers planning such investigations. The analysis of muscle function is a more difficult problem. So many factors of muscle activity can only be determined by physiological experiments that a useful analysis would appear possible only when using a few species that can be studied experimentally. For instance the student who wishes to analyze evolutionary adaptations in a large group of birds for which only preserved specimens are available will be unable to attack most of these problems. We may then ask whether it is better to do what is possible with the material available or to abandon such studies altogether. I would favor the former approach, but some readers may find Bock's arguments discouraging.

In the section on comparative morphology and systematics Bock defines homologous features as those that "can be traced back phylogenetically to the same feature... in the immediate common ancestor..." Although this definition includes no methods of accomplishing this tracing, the use of the phrase "can be traced back" is unfortunate. If taken literally it would make the concept of homology almost useless in practice, because there is no way to trace back features to a common ancestor with certainty; there are only various methods of inferring this relationship. In a formal theoretical definition it might be better to replace the phrase "can be traced back phylogenetically to..." with something like "have evolved from". This, however, might lead to circular reasoning in which homology and phylogeny are defined in terms of each other, a problem which Bock discusses and tries to avoid.

In Chapter 4 William A. Calder and James R. King review the thermal and caloric relations of birds. They discuss the physics of heat exchange and relate the theoretical model to the complex problems of a living bird in a variable environment. Much early physiological work was done with captive birds in controlled laboratory conditions, which are much simpler than the situation in nature. Nevertheless, the authors con-

clude that these studies form a reliable basis for analyzing the natural situation. The physiological responses to heat and cold are discussed at length, as is hypothermia. One important point that is brought out in this review is that birds are much more variable in their physiological responses to thermal stress than is generally appreciated, particularly in their ability to conserve energy by reducing metabolic activity under cold conditions.

Chapter 5, by M. Berger and J. S. Hart, deals with the physiology and energetics of flight. It opens with the old question of whether respiratory movements are coordinated with wing-beats. Recent work shows that they are coordinated in varying patterns, usually with several wing-beats to each respiratory movement. There are distinct patterns of coordination in different phases of flight, and in birds with different wing-loadings.

Respiratory rate increases during flight, but oxygen extraction decreases, showing that ventilation increases more rapidly than metabolic need requires. Fat is the main energy source in flight. Oxygen consumption is greatest during ascending flight, least during descent. Variations related to body size are discussed. A review of circulatory adaptations emphasizes heart rate and heart size relative to body weight in birds as compared to mammals. Other subjects considered include temperature regulation, water loss, and energy turnover during migration. The general approach is quantitative, and data from the literature are summarized in extensive tables.

The book ends with author, subject, and bird name indices. This volume, like others in the series, is marked by a high level of both scholarship and price.—ROBERT J. RAIKOW.

A FIELD GUIDE TO MEXICAN BIRDS. FIELD MARKS OF ALL SPECIES FOUND IN MEXICO, GUATEMALA, BELIZE (BRITISH HONDURAS), EL SALVADOR. By Roger Tory Peterson and Edward L. Chalif. Houghton Mifflin Co., Boston, 1973:xxiii + 298 pp., 48 color plates, end-papers (maps). \$8.95.—Peterson's long-awaited field guide to Mexican birds now exists as worn field copies, and we may try to assess it (and its predecessors) as contributions to ornithology and field identification. The full title makes one wonder whether even R. T. Peterson could cover this large, complex region and maintain his usual standards. Alas, he did not.

What the Peterson-Chalif guide (hereafter P&C) gives us is an erratic text and good plates of adults of strictly Mexican birds, i.e. species not, or only locally found in the U.S., supplemented by U.S. species in some problem genera. In the 48 crowded plates the general standards are high, but we found minor inaccuracies in bill shapes, colors, and patterns too numerous to list here.

One trouble is that omission of most northern birds from the plates makes P&C, like its predecessors, only a partially illustrated guide. Anyone wishing plates of all Mexican species must carry at least one additional guide. Confusing young of such birds as the Hepatic Tanager and Brown-headed Cowbird are not included. Further, major variations in a number of species are also omitted; for example, no female quail is illustrated. Field guides, too, need their "taxonomic editor" if produced by those unfamiliar with an area and its birds. Most unfortunate is the absence from the list of those who aided P&C, of all of the few bird students ever resident in Mexico and most of the more active recent visitors.